



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,094	11/03/2003	HuaYuan Chen	STL11457	2820

7590 01/30/2006
Seagate Technology LLC
1280 Disc Drive
Shakopee, MN 55379

EXAMINER

GOGIA, ANKUR

ART UNIT PAPER NUMBER

2187

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/700,094	CHEN ET AL.	
	Examiner	Art Unit	
	Ankur Gogia	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-10, 15-18 and 20-22 is/are rejected.
- 7) ☒ Claim(s) 5, 11-14, 19 and 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. <u>01092006</u> |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/3/03</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The instant application, having Application No. 10/700,094, has a total of 23 claims pending in the application; there are 3 independent claims and 20 dependent claims, all of which are ready for examination by the examiner.

Oath/Declaration

2. The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in 37 C.F.R. 1.63.

Information Disclosure Statement

3. As required by M.P.E.P. 609(c), the applicant's submission of the Information Disclosure Statement, dated 3 November 2003, is acknowledged by the examiner and the cited references have been considered in the examination of the claims now pending. As required by M.P.E.P. 609(c)(2), a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.

Specification

4. The abstract of the disclosure is objected to because on line 7 it states "n a multi-head ...". It is believed that the applicant intended to state "In a multi-head ...". Correction is required. See MPEP § 608.01(b).

5. Claims 2, 16 and 21 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The claims disclose wherein the plurality of head and track numbers are mapped to a corresponding unique virtual track number, however this is already disclosed in the respective parent claims.

Claim Objections

6. Claim 15 is objected to because of the following informalities: The claim recites on line 3 "plurality of physical **of physical** data tracks" where "of physical" is repeated. Appropriate correction is required.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-4, 6, 8-10, 15-18 and 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Chng et al. (2002/0101675).

Independent Claim 1

Chng et al. disclose a method of representing a serpentine track accessing format, the method comprising:

obtaining a plurality of head and physical track number pairs in the serpentine track accessing format (**inherent; Fig. 4 and ¶s 28-30 disclose mapping head and cylinder(physical track numbers) to virtual track numbers and although it is not explicitly stated that the pairs are obtained, they must be obtained before they**

can be mapped. Furthermore, ¶s 30-31 disclose that the access format is a serpentine format); and

mapping each of the plurality of head and physical track number pairs to a corresponding unique virtual track number (Fig. 4; ¶s 28-30).

Claim 2

Chng et al. further disclose wherein mapping each of the plurality of head and physical track number pairs to their corresponding unique virtual track number further comprises assigning a unique virtual track number to each of the plurality of head and physical track number pairs in a manner such that the no two head and physical track number pairs are assigned the same virtual track number (Fig. 4; **As is shown in the figure the track numbers are unique for each head and cylinder pair**).

Claim 3

Chng et al. further disclose wherein mapping each of the plurality of head and physical track number pairs to their corresponding unique virtual track number further comprises assigning the unique virtual track number to each of the plurality of head and physical track number pairs in a manner which results in the virtual track numbers being in a monotonic order as the head and physical track number pairs are sequentially traversed in the serpentine track accessing format (Fig. 4 and ¶s 30-31; **From the figure it is shown that as the tracks are accessed in a serpentine manner (dotted line path) the track numbers are strictly increasing and are therefore monotonic**).

Claim 4

Chng et al. further disclose wherein the monotonic order is a monotonically increasing order (**Fig. 4; From the figure it is shown that as the tracks are accessed in a serpentine manner (dotted line path) the track numbers are strictly increasing and are therefore monotonically increasing**).

Claim 6

Chng et al. further disclose wherein the serpentine track accessing format is a track serpentine format (**Fig. 4 and ¶31; In the figure it is shown that the track accessing format can be either head or track serpentine**).

Claim 9

Chng et al. further disclose a translation engine configured to implement the method of claim 1 (**inherent; Although it is not stated explicitly there must be a “translation engine” to generate the mapping from head and physical tracks to a virtual track number**).

Claim 10

Chng et al. further disclose a multi-head disc drive data storage system including the translation engine of claim 9, wherein mapping each of the plurality of head and physical track number pairs to corresponding unique virtual track numbers makes the multi-head drive a functional equivalent of a single head disc drive data storage system having the virtual track numbers (**Figs. 2 and 4; As shown in fig. 4 as the track numbers are unique for each head and cylinder pair and monotonically increasing as the heads traverse the disk in a serpentine manner each track**

switch will result in a new track number that is greater than the previous track number. In a multi-head drive the track numbers would repeat after a head switch, whereas in the reference the track numbers are different on each surface and therefore the multi-head drive appears as a single head drive).

Claim 15

Chng et al. disclose a data storage system comprising:

a plurality of recording surfaces (**¶19**), with each recording surface including a plurality of physical data tracks (**¶26**);

a plurality of heads, with each of the plurality of heads positioned adjacent to one of the plurality of recording surfaces, thereby forming a plurality of head and physical track number pairs in a serpentine track accessing format (**¶s 19 and 30**); and

a translation engine configured to obtain the plurality of head and physical track number pairs in the serpentine track accessing format, and to map each of the plurality of head and physical track number pairs to a corresponding unique virtual track number (**inherent; Fig. 4 and ¶s 28-30 disclose a mapping from a head and cylinder pair to a track number and although it is not stated explicitly, there must be a “translation engine” to generate the mapping from head and physical tracks to a virtual track number**).

Claim 16

Chng et al. further disclose wherein the translation engine is configured to map each of the plurality of head and physical track number pairs to their corresponding unique virtual track number in a manner such that the no two head and physical track

number pairs are assigned the same virtual track number (**Fig. 4; As is shown in the figure the track numbers are unique for each head and cylinder pair**).

Claim 17

Chng et al. further disclose wherein the translation engine is configured to map each of the plurality of head and physical track number pairs to their corresponding unique virtual track number by assigning the unique virtual track number in a manner which results in the virtual track numbers being in a monotonic order as the head and physical track number pairs are sequentially traversed in the serpentine track accessing format (**Fig. 4 and ¶s 30-31; From the figure it is shown that as the tracks are accessed in a serpentine manner (dotted line path) the track numbers are strictly increasing and are therefore monotonic**).

Claim 18

Chng et al. further disclose wherein the monotonic order is a monotonically increasing order (**Fig. 4; From the figure it is shown that as the tracks are accessed in a serpentine manner (dotted line path) the track numbers are strictly increasing and are therefore monotonically increasing**).

Claim 20

Chng et al. disclose a data storage system comprising:
a plurality of head and physical track number pairs in a serpentine track accessing format (**¶s 29 and 30**); and
translation engine means configured to map each of the plurality of head and physical track number pairs to a corresponding unique virtual track number (**inherent**;

Fig. 4 and ¶s 28-30 disclose a mapping from a head and cylinder pair to a track number and although it is not stated explicitly, there must be a “translation engine” to generate the mapping from head and physical tracks to a virtual track number).

Claim 21

Chng et al. further disclose wherein the translation engine is configured to map each of the plurality of head and physical track number pairs to their corresponding unique virtual track number in a manner such that the no two head and physical track number pairs are assigned the same virtual track number **(Fig. 4; As is shown in the figure the track numbers are unique for each head and cylinder pair).**

Claim 22

Chng et al. further disclose wherein the translation engine is configured to map each of the plurality of head and physical track number pairs to their corresponding unique virtual track number by assigning the unique virtual track number in a manner which results in the virtual track numbers being in a monotonic order as the head and physical track number pairs are sequentially traversed in the serpentine track accessing format **(Fig. 4 and ¶s 30-31; From the figure it is shown that as the tracks are accessed in a serpentine manner (dotted line path) the track numbers are strictly increasing and are therefore monotonic).**

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being obvious over Chng et al. in view of Dobbek (6,535,995).

Claim 7

Chng et al. further disclose storing virtual track numbers in a table (**Fig. 4**).

Chng et al. do not disclose expressly that the table is indexed by the virtual track numbers.

Dobbek discloses wherein a table for storing virtual track numbers is indexed by virtual track numbers (**Col. 2, Lines 20 and 44-45**).

Chng et al. and Dobbek are analogous art because they are from the similar problem solving area of efficient mapping from logical block address to physical block address.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Chng et al. and Dobbek before them, to index a virtual track table by the virtual track number.

The motivation for doing so would have been to provide more efficient utilization of storage system resources (**Abstract**).

Therefore, it would have been obvious to combine Dobbek with Chng et al. for the benefit of more efficient utilization of storage system resources to obtain the invention as specified in claim 7.

Claim 8

Chng et al. further disclose searching the table using the virtual track numbers as the search parameter (**inherent; Given the map in fig. 4, where the only parameters are the head and cylinder pair and the virtual track numbers for the system to obtain the head and physical track number pair given the virtual track number it must search the table using the virtual track number**).

Allowable Subject Matter

10. Claims 5, 11-14, 19 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

The primary reasons for indication of allowable subject matter in claims 5, 19 and 23 in the instant application are the combination with the inclusion in these claims that the **monotonically increasing order is a non-continuous monotonically increasing order**. The prior art of record neither anticipates nor renders obvious the above recited combination.

The primary reasons for indication of allowable subject matter in claim 11 in the instant application are the combination with the inclusion in these claims that **selecting a modulo M which is greater than or equal to the a maximum number of tracks per physical zone per head multiplied by a total number of heads; within each physical zone, assigning each physical track an offset value N sequentially, wherein offset value N is less than or equal to M-1; assigning each physical zone a unique value P which reflects its traversing sequence; and for each physical track, combining its offset value N and the unique value P assigned to its corresponding physical zone to obtain the corresponding unique virtual track number K.** The prior art of record neither anticipates nor renders obvious the above recited combination.

The primary reasons for indication of allowable subject matter in claims 12-14 in the instant application are their dependence on claim 11, which has been indicated as having allowable subject matter.

: IMPORTANT NOTE :

If the applicant should choose to rewrite the independent claims to include the limitations recited in either one of claims 5, 11-14, 19 or 23, the applicant is encouraged to amend the title of the invention such that it is descriptive of the invention as claimed as required by sec. 606.01 of the M.P.E.P. Furthermore, the Summary of the Invention and the Abstract should be amended to bring them into harmony with the allowed claims as required by paragraph 2 of sec. 1302.01 of the M.P.E.P.

As allowable subject matter has been indicated, applicant's response must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 C.F.R. 1.111(b) and 707.07(a) of the M.P.E.P.

Conclusion

12. The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. 707.07(i):

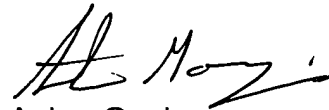
- a. Claims 5, 11-14, 19 and 23 have been objected to as depending from rejected claims and have been indicated as having allowable subject matter.
- b. Per the instant office action, claims 1-4, 6-10, 15-18 and 20-22 have received a first action on the merits and are subject of a first action non-final.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ankur Gogia whose telephone number is 571-272-4166. The examiner can normally be reached on M-F 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 571-272-4201. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2187

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ankur Gogia
Examiner
Art Unit 2187

1/20/06



CHRISTIAN CHACE
PRIMARY EXAMINER